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Armstrong's  
EF - 26

Armstrong's  
EF - 22

Armstrong's  
A - 25

# Armstrong's INSULATING FIRE BRICK

*for all types of heated equipment*

Armstrong's  
A - 16

Armstrong's  
A - 20

FRANKLIN INSTITUTE  
PHILADELPHIA

# INSULATING FIRE BRICK

*cut fuel costs, speed production and  
insure more accurate temperature control*

## ESSENTIAL REQUIREMENTS OF EFFICIENT HIGH TEMPERATURE INSULATION

**E**FFICIENCY of high temperature insulation depends upon the following important factors:

1. Thermal Conductivity—The fundamental purpose of heat insulation is to reduce heat losses and, therefore, low thermal conductivity is one of the most important requirements of a heat insulating material.
2. Physical Strength—The insulation must be sufficiently strong to withstand the customary rough treatment in shipment and handling on the job without appreciable loss either by breaking or loss of corners. Installation of broken insulation results in not only increased labor costs but reduced efficiency. It is equally important that the physical strength of the insulation at the temperature used provides a margin of safety sufficient to withstand stresses that are due to direct heating or thermal expansion.
3. Uniformity—Accurate sizing of all standard brick and standard shapes insures tight joints if the insulation is laid dry or permits a much thinner joint if laid with cement. Constant manufacturing control is necessary to produce individual brick that are uniform in composition and structure.
4. Refractoriness—The insulation material must be manufactured of the proper clays to eliminate excessive shrinkage at the maximum recommended temperature; otherwise the overall heat transmission will be high and the strength of the complete structure will be impaired. At the same time it must also effectively resist sudden and uncharged shock. Different service requirements demand it is essential to have brick of different characteristics to give the best and most efficient service. Temperature alone is not the primary deciding factor.

## EFFICIENCY OF ARMSTRONG'S INSULATING FIRE BRICK PROVED IN SERVICE

Armstrong's Insulating Fire Brick through years of satisfactory performance have proved that they meet all the essential requirements for efficient service—low thermal conductivity, high physical strength, uniformity in size and composition, low shrinkage and ample refractoriness for the use intended. Since 1914 Armstrong has pioneered improvements in Insulating Fire Brick and has been a leader in the manufacture of the insulating materials.

Armstrong's first Brick were originally designed for insulating purposes as a "backing-up" brick. Subsequent experiments and tests in actual service have not only improved the brick for this type of service, but have also developed the use of all of Armstrong's Insulating Fire Brick as refractory lining.

Actual service requirements have demonstrated that it is essential to have brick of varying characteristics to meet specific needs. As a result, Armstrong has developed five individual brick, making it possible to furnish brick especially suited for each required service. Insulating Fire Brick, as a rule, are not designed to resist slagging action or direct impingement of flame. Wherever these conditions cannot be avoided, surface coatings should be applied to the brick after installation.

Armstrong's Insulating Fire Brick are not suitable for installation in all places where fire brick are now used, but their acceptance and use is being constantly increased due to improved furnace design and methods of firing. These brick are equally serviceable for electrically heated, coal, oil, or gas fired equipment. For specific installations, an Armstrong representative should always be consulted for definite recommendations.

Each of Armstrong's Insulating Fire Brick is ideally adapted for the service recommended. Light in weight,



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is not in excess of 2000 degrees F. The weight of a straight ( $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$ ) is 2.1 pounds and the cold crushing strength is 300 pounds per sq. in.

#### **ARMSTRONG'S A-25 BRICK**

Armstrong's A-25 Brick was formerly known as Armstrong's Brick. It does not crack, fuse, or spall under temperatures as high as 2500 degrees behind the refractory and it is used directly exposed in a great many instances. It serves as a refractory lining where heavy duty is not required, but is most generally used as backing-up brick. The weight of a straight ( $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$ ) brick is 2.2 pounds and its crushing strength is 225 pounds per sq. in.

#### **ARMSTRONG'S EF-22 BRICK**

Armstrong's EF-22 Brick was primarily designed for heavy duty in direct exposure up to 2200 degrees F., and is adaptable to practically any type of exposed service. It is a straight ( $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$ ) brick and weighs 2.75 pounds. Its crushing strength is 340 pounds per sq. in.

#### **ARMSTRONG'S EF-26 BRICK**

Armstrong's EF-26 Brick is a heavy duty Insulating Fire Brick that can be used in practically any service up to a hot face temperature of 2600 degrees F. A straight ( $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$ ) brick weighs 2.75 pounds and has a cold crushing strength of 450 pounds per sq. in.

#### **SPECIAL SHAPES**

Due to the ever increasing demand for special shapes made to customers' specifications as to size, Armstrong has established a plant department for the sole purpose of manufacturing custom built shapes. Special shapes are made to match each of the five types of brick which Armstrong manufactures and are of two distinct classes—machined to size and molded to size.

The machined-to-size pieces are of the same conductivity as the standard brick and standard shapes and are produced by accurately machining large size pieces of rough stock to the dimensions required. Pieces produced by this method of manufacture are machined to an accuracy of .004 of an inch on all dimensions.

Molded-to-size special shapes are slightly heavier than standard stock material and are produced by molding and firing to the shape desired with a tolerance of  $\frac{1}{16}$ . Tolerances in size permit a variation from specified dimensions covering both warpage and shrinkage of plus or minus 3% for dimensions under 4" and plus or minus 2% for dimensions over 4".

The handling of these special shapes in a separate department makes it possible to get a much better finished product and to speed delivery to customers.

#### **DESIGNATION AND TERMINOLOGY OF ARMSTRONG'S BRICK**

The proper nomenclature to be used in describing the different products manufactured by Armstrong in the Insulating Fire Brick line is as follows:

1. **"Standard Brick"**—This term indicates the following specific sizes:

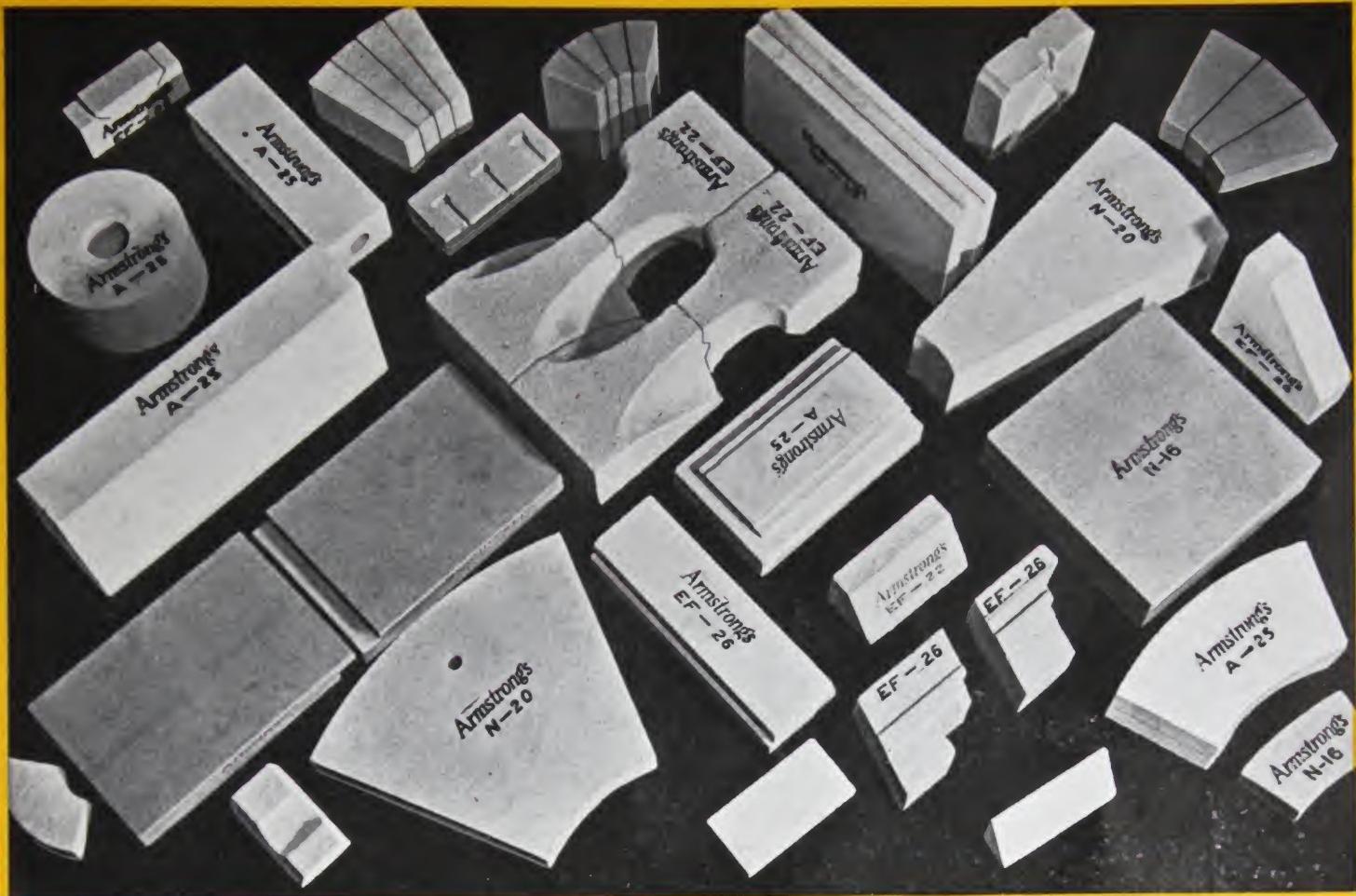
Spirals ( $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$ ) or  
( $9 \times 4\frac{1}{2} \times 3$ )

Splits ( $9 \times 4\frac{1}{2} \times 1\frac{1}{4}$ ) or  
( $9 \times 4\frac{1}{2} \times 1\frac{1}{2}$ )

Soaps ( $9 \times 2\frac{1}{2} \times 2\frac{1}{4}$ ) or  
( $9 \times 3 \times 2\frac{1}{4}$ )

2" Brick ( $9 \times 4\frac{1}{2} \times 2$ )

2. **"Standard Shapes"**—All other types of brick which appear on the regular price lists including the different Wedge, Key, Arch, Neck, Skew, Feather Edge, Circle and No. 105 Slotted Arch Type, both



$4\frac{1}{2}$  and 9" way, in both the  $2\frac{1}{2} \times 3"$  series are properly termed "Standard Shapes."

3. "Special Shapes"—All other brick forms not outlined above are properly termed "Special Shapes" and must be further identified by one of the two following designations:

- a. "Machined to Size"—(produced by using large size rough stock and machining to size with a .004" tolerance).
- b. "Molded to Size"—(produced by molding to size with a Standard Fire Brick tolerance. These pieces are molded, fired, and shipped without any type of machining).

NOTE: When specifying any brick size always start with the largest dimension followed progressively by descending dimensions. (Example:  $9 \times 4\frac{1}{2} \times 2\frac{1}{2}"$ .)

#### SPECIAL TECHNICAL SERVICE

Armstrong maintains a group of qualified High Temperature engineers in leading industrial sections of the country who are thoroughly experienced in all types of design where high temperature insulation is required. These engineers will be glad to assist you in the selection of the proper materials to be used and to recommend its proper application. This service is without obligation or

charge and can be secured by communicating with Armstrong's nearest district office or representative as listed on the last page of this booklet.

The Armstrong Central Technical Laboratories are also available for research on unusual problems.

For engineers wishing to make an open specification for high temperature insulation, Armstrong will be pleased to furnish upon request a complete specification outlining the standards required for the different physical characteristics with permissible tolerances.

#### OTHER ARMSTRONG INSULATING MATERIALS

In addition to Armstrong's Insulating Fire Brick, these other products of the same Armstrong high quality and efficiency are offered:

ARMSTRONG'S HIGH TEMPERATURE BLOCK is a superior insulating material in block form. Detailed information concerning the temperature limits, conductivity, and other physical characteristics will be furnished upon request. These blocks can be furnished in thicknesses of 1",  $1\frac{1}{2}"$ , 2" or 3" and in sizes up to  $12 \times 36"$ .

#### ARMSTRONG'S CEMENTS

Although all Armstrong's Insulating Fire Brick can be laid up dry, a complete line of cements for laying and fac-

**TABLE SHOWING CHIEF CHARACTERISTICS OF ARMSTRONG'S INSULATING FIRE BRICK**

BRAND OF BRICKS	LIGHT DUTY			HEAVY DUTY	
	Armstrong's N-16	Armstrong's N-20	Armstrong's A-25	Armstrong's EF-22	Armstrong's EF-26
Temperature Limits	1600° F. on Hot Face of Brick	2000° F. on Hot Face of Brick	2500° F. on Hot Face of Brick	2200° F. on Hot Face of Brick	2600° F. on Hot Face of Brick
Crushing Strength (Cold)	205 Lbs. per Sq. In.	280 Lbs. per Sq. In.	260 Lbs. per Sq. In.	430 Lbs. per Sq. In.	450 Lbs. per Sq. In.
Weight—Standard Straight Brick	1.8 Lbs. Each	1.9 Lbs. Each	2.2 Lbs. Each	2.75 Lbs. Each	2.75 Lbs. Each
Shapes	All standard brick and standard shapes of N-16, N-20, A-25, EF-22, and EF-26 Brick in stock; machined accurately to size with .004" tolerance. Stocks carried at the factory and branch warehouses. Special shapes molded or machined to size, manufactured to specifications.				

**TABLE SHOWING CHIEF CHARACTERISTICS OF ARMSTRONG'S CEMENTS**

	ARMSTRONG'S No. 1600 CEMENT	ARMSTRONG'S No. 2500 CEMENT	ARMSTRONG'S No. 2600 CEMENT	ARMSTRONG'S AIR SET CEMENT	ARMSTRONG'S FACING CEMENT (Sillimanite)	ARMSTRONG'S MONOLITHIC CEMENT
Cement Used for	Laying N-16 Brick.	Laying N-20 and A-25 Brick.	Laying and facing EF Type Insulating Fire Brick.	Laying and facing all brands where a strong bond is desired.	As a facing for temperatures of 2500° F. and over. Rarely used for bonding.	
Packed in	Burlap Bags of 100 Lbs. Net.	Burlap Bags of 100 Lbs. Net.	Burlap Bags of 100 Lbs. Net.	16, 50, 95, 190-Lb. Net Steel Drums.	20, 50, 100, 200, 300-Lb. Net Steel Drums.	Burlap Bags of 50 or 100 Lbs. Net.
Weight per Cu. Ft. as Shipped—Lbs.	50 Lbs.	62 Lbs.	68 Lbs.	110 Lbs.	120 Lbs.	34.5 Lbs.
Amount of Water Needed for Dip Joint Consistency Gals. per 100 Lbs. Cement	9 Gals.	6 Gals.	5½ Gals.	1¼ Gals.	1 Gal.	
Amount of Water Needed for Brushing Consistency Gals. per 100 Lbs. Cement			6½ Gals.	2¼ Gals.	1¾ Gals.	
Pounds of Cement Required for Dip Joints per Thousand Brick, Bonded	N-16 N-20 A-25 EF-22 EF-26	150 Lbs. 200 Lbs. 150 Lbs. 200 Lbs. 200 Lbs.		300 Lbs. 250 Lbs. 250 Lbs. 300 Lbs. 300 Lbs.		
Pounds of Cement Required for Double Brush Coating One Square Foot of Armstrong's Brick.	N-16 N-20 A-25 EF-22 EF-26			0.5 Lb. 0.5 Lb. 0.5 Lb. 0.5 Lb. 0.5 Lb.	0.5 Lb. 0.5 Lb. 0.5 Lb. 0.5 Lb. 0.5 Lb.	
<b>ADDITIONAL INFORMATION</b>						
Covering Capacity 270 Lbs. per 100 Bd. Ft.						
Water Required 20 Gals. per 100 Lbs. of Dry Cement,						
<b>Caution:</b> Should be used within 4 hrs. after mixing.						
Drying Shrinkage 2.9% of original length.						
Firing Shrinkage 2.63% of dry dimension after 3 hrs. at 1500° F.						

ing the brick are manufactured. A table giving the characteristics and amounts required is illustrated above. A special booklet on cements has been prepared and will be furnished to you upon request.

#### ARMSTRONG'S MONOLITHIC CEMENT

Armstrong's Monolithic Cement is a cement manufactured for use as an exterior coating for furnace walls or structural equipment. It may also be used as a filler between the furnace walls and steel jacket or in confined spaces. Physical characteristics of this cement are given in the table reproduced above.

#### ARMSTRONG-CORNING WOOL

Armstrong-Corning Wool is a mineral, fibrous material furnished in bats, metal mesh blankets, rolls, or tufted.

#### OTHER ARMSTRONG INSULATION AND BUILDING PRODUCTS

**ARMSTRONG'S HIGH TEMPERATURE BLOCK.** For all types of heated equipment.  
**ARMSTRONG'S CORKBOARD** for insulating cold storage rooms, walls and roofs of commercial and public buildings and residences, refrigerator cars, commercial display cases, refrigerators, tank cars, and trucks.  
**ARMSTRONG'S CORKOUSTIC** for noise-quieting and acoustical correction.  
**ARMSTRONG'S CORK COVERING** for refrigerated drinking water systems, brine, ammonia, and all cold lines.

This efficient material can be used in all types of heated equipment provided the temperature on the hot face of the insulation does not exceed 900 degrees F.

#### DIATOMACEOUS EARTH

Armstrong's Diatomaceous Earth can be furnished for insulating purposes either in the raw state (powdered or coarse) or calcined. It is calcined at temperatures in excess of 2000 degrees F.

The weight packed dry is 27 pounds per cu. ft.

#### PRICE LISTS AND SAMPLES

For further details, complete information, price lists, and samples, contact the nearest Armstrong district office or write directly to Armstrong Cork Products Company, Building Materials Division, Lancaster, Pa.

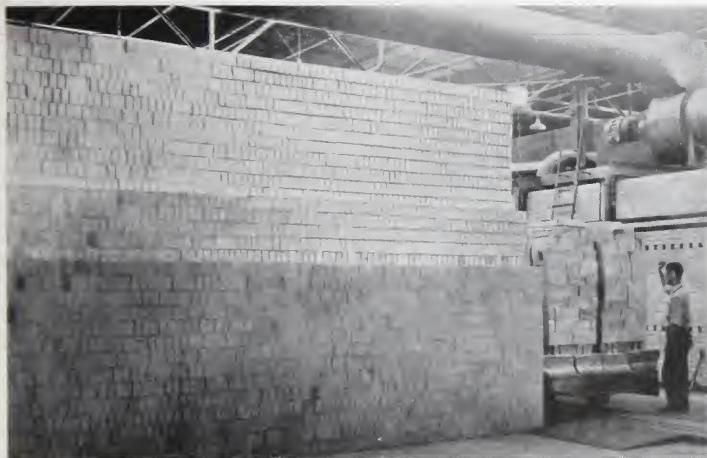
**ARMSTRONG'S VIBRACORK** for absorbing vibration and reducing noise in all types of machinery.  
**ARMSTRONG'S TEMLOK** for roof, refrigerator, and equipment insulation.  
**ARMSTRONG'S TEMLOK BUILDING INSULATION** for sheathing, plaster base, wallboard, and acoustical treatment.



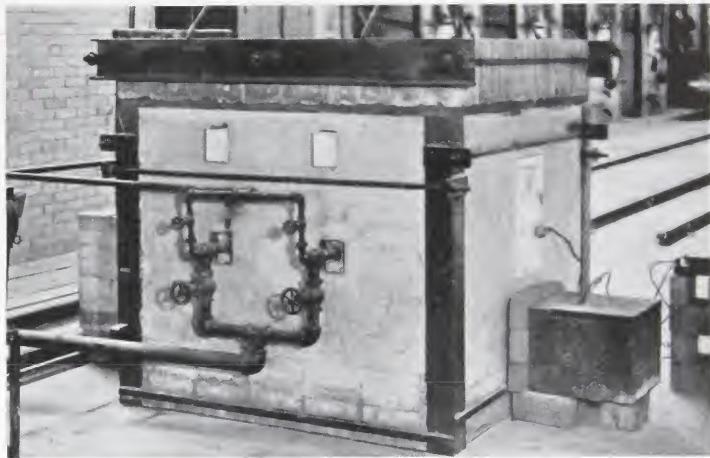
Giant Press used for molding all types of insulating brick made by Armstrong. The accurate control mechanism assures correct pressures and press speeds. Automatic conveyors carry the brick directly to the dryers.



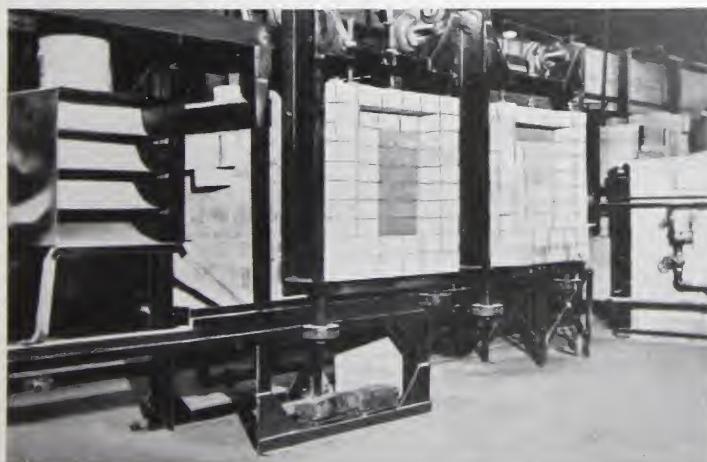
A Tunnel Kiln specially designed for firing Armstrong's Insulating Brick. Exact temperatures are controlled by a recording potentiometer system and additionally checked with pyrometric cones on each kiln car.



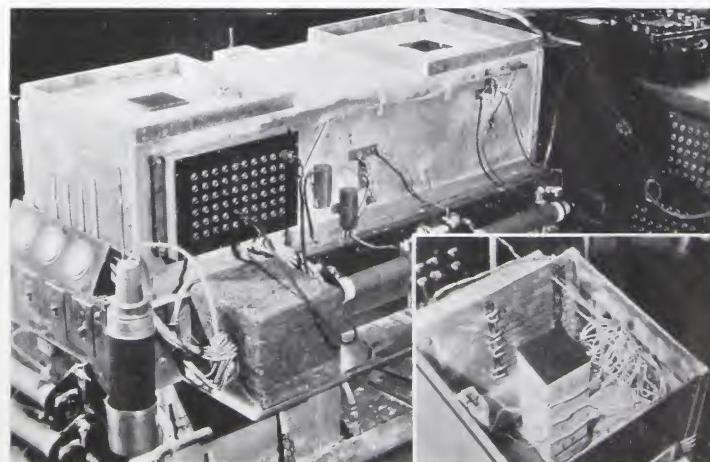
Accurate sizing insures tight joints which give operating efficiency. Note the even set-offs in this pile of insulating brick at the Armstrong factory. The bricks as they come from the kiln are shown on the extreme right.



Test Kiln (for temperatures from 1000° to 3000° F.) at the Armstrong factory, Beaver Falls, Pa. Here experiments are conducted with different mixes, temperatures, and burning periods.



Spalling Test Furnace used to test insulating brick under U. S. Navy specifications for spalling test. Bricks in panel forms are alternately heated in the furnace and cooled by air blast.



Heat Flow Test Equipment in Central Technical Laboratory, Lancaster, Pa. Inset—Close-up of heat flow testing equipment showing samples in position and thermocouple leads.

# ARMSTRONG CORK PRODUCTS CO.

*Building Materials Division*

L A N C A S T E R , P E N N S Y L V A N I A



## *District and Branch Offices*

### ALBANY

1-3 Thacher Street

### ATLANTA

424-26 West Peachtree Street

### \*BUFFALO

329-331 Ellicott Street

### CHARLOTTE, N. C.

508 Johnston Building

### \*CHICAGO

111 N. Canal Street

After April 15, 1937

13th Floor Merchandise Mart

222 N. Bank Drive

### \*CINCINNATI

232 West Seventh Street

### \*CLEVELAND

812 Huron Road

### COLUMBUS

37 N. Third Street

### DALLAS

1022 Santa Fe Building

### DES MOINES

225 Fifth Street

### \*DETROIT

1627 W. Fort Street

### HOUSTON

903 Marine Bank Building

### INDIANAPOLIS

863 Massachusetts Ave.

### JACKSONVILLE, FLA.

1224 Barnett Natl. Bank Bldg.

### \*KANSAS CITY, MO.

1535 Walnut Street

### \*LOUISVILLE, KY.

1420 Heyburn Building

### MILWAUKEE

1011 Majestic Building

### \*MINNEAPOLIS

512 Plymouth Building

### NEW ORLEANS

219-223 Tchoupitoulas Street

### \*NEW YORK

295 Fifth Avenue

### OMAHA

109 South Tenth Street

### \*PITTSBURGH

24th St. & Allegheny River

### ROCHESTER

1 Mt. Hope Avenue

### SEATTLE

803 Terminal Sales Building

### \*ST. LOUIS

1215 Washington Ave.

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\*BALTIMORE, MD.  
John R. Livezey

\*BOSTON, MASS.  
T. R. Nunan Co.

CHARLESTON, W. VA.  
Capital City Supply Co.

\*CHICAGO, ILL.  
Risher Fire Brick Co.

\*DENVER, COLO.  
Stearns-Roger Mfg. Co.

\*DETROIT, MICH.  
Frederick B. Stevens

JOHNSTOWN, PA.  
Haws Refractories Co.

LITTLE ROCK, ARK.  
Fischer Cement & Roofing Co.

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Van Fleet-Freear Co.

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Fire Brick Engineers, Inc.

\*MOLINE, ILL.  
Fire Brick Specialties Co.

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